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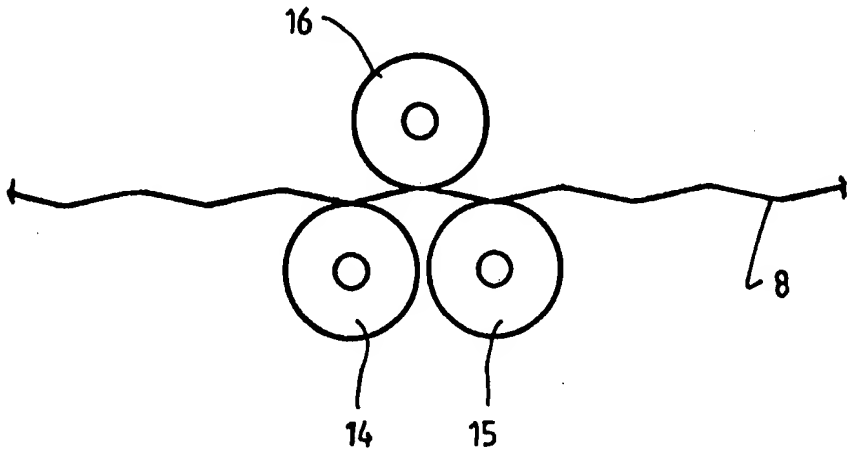

(57) Abstract

The present invention relates to continuous cold–forming of strip material to produce building elements having transverse ribs extending across at least part of the element. Cold–forming elements of this kind is often difficult because of the inherent tendency of thin strip to twist and distort as it issues from transverse rib forming means. The present invention addresses this problem by providing stress relief means for applying compression load to the transverse ribs immediately downstream of each pair of transverse rib–forming rolls. The stress relief means comprises a first roller means and a second roller means forming a nip for receiving ribbed strip (8), wherein each roller means is disposed to engage an outer crest portion of each rib (5) projecting towards it. The second roller means comprises a pair of substantially parallel coextensive spaced–apart second rollers (14, 15) and the first roller means comprises a first roller (16), said first roller (16) being substantially parallel to, coextensive with and equi–spaced from each of said second rollers (14, 15).

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COLD-FORMING

The present invention relates to continuous cold-forming of strip material and particularly but not exclusively to sheet metal strip to produce building elements having transverse ribs extending across at least part of the element.

In a continuous cold-forming line for forming such elements a strip is generally passed to a rib-forming stand where the strip is passed through the nip of a pair of cylindrical rolls having respectively a plurality of mating projections and recesses, elongated axially of the rolls and spaced apart on their circumference. Generally the rolls are geared to each other to maintain mating projections and recesses in register with each other thereby portions of the strip material are pushed into the recesses to permanently deform the strip to form the ribs.

However it has been found that continuous cold-forming of transverse ribs in strip by such means generally produces undue residual stresses in the strip, which can cause twisting, buckling and other warping of the formed strip.

A number of prior art proposals have been put forward to continuously cold-form transverse ribs in strip. For example;

US 3,673,838 describes a cold-forming line for continuously forming transverse stiffening ribs on metal strip, the line having a set of transverse rib forming rolls intermediate a back tension roll and a forward tension roll, wherein the strip passing through the nip of the rib-forming rolls is held in tension by the forward and back tension rolls. The forward tension roll and the die roll (one of the rib-forming rolls) form a nip through which the ribbed strip is passed. The forward tension roll engages the back face of the strip devoid of projecting ribs while the ribs remain in recesses in the die roll.

US 3,394,573 describes apparatus for continuously cold-forming transverse corrugations on metal strips, the apparatus having a set of corrugating rolls intermediate a back tension roller set and a forward tension roller set. The formed strip has a web provided with transverse corrugations and cold-formed side flanges. The back tension roller set cold-forms the flanges and tightly holds the strip in the nip between the rollers. The forward rollers conform to the form of the strip passing through the rotating die rolls. That is to say that they are provided with respective mating projections and recesses corresponding to those of the die rolls.

US 4,027,517 also describes cold-forming apparatus for providing strip with transverse corrugations between profiled longitudinal flanges. The apparatus comprises continuous corrugating embossing means and means to hold the strip under tension as it passes through the embossing means. In one of the embodiments described a roll is provided downstream of a downstream tensioning roll to apply "flattening pressure on the sheet metal". The flattening roll engages only those portions of the sheet that have not been induced into die recesses and portions of the sheet metal between transverse indentations.

US 4,059,000 also describes apparatus for continuously cold-forming transverse corrugations on metal strips, the apparatus including means to maintain the strip in tension as it passes through embossing rolls and straightening/flattening means.

In all the above proposals the strip passing through the nip of the rib-forming rolls is held in tension, and in many, the line is further provided with downstream straightening means.

US 3,137,922 proposes a somewhat different approach in that it proposes a cold-forming/working line for continuously forming metal roof panels having centrally disposed transverse stiffening ribs from metal strip in which the line includes a plurality of flange forming stations, a combined cold-reducing and embossing stand and straightening roll stands. The combined cold-reducing embossing stand is provided with cold-reduction/drawing means to variably elongate the central portion of the strip prior to the strip being passed through the nip of a pair of embossing rolls which provide transverse ribs in said central portion of the strip. The embossing rolls are geared to each other to maintain mating projections and recesses in register with each other. The straightening stand comprises a downstream roll stand having a number of sets of upper and lower rolls engaging only the flanges of the strip to straighten any irregularities in the flanges resulting from the cold working and embossing operations and for drawing the strip through the apparatus. Intermediate the downstream roll stand and the embossing rolls the strip is passed beneath a manually operated downwardly-moveable wooden shoe for engaging the upper surface of the embossed sheet, said upper surface being devoid of transverse ribs, "to relieve rolling stresses resulting from the embossing operation and thus preventing later distortion and twisting of the panel". Intermediate the flange-engaging portions of the upper and lower rolls in the downstream roll stand there is further provided a manually operable upwardly-acting pad underlying the strip for engagement therewith to assist in the further relief of embossing stresses. Thus when flanges of the strip are gripped by the upper and lower rolls, a lever is manually operated so that the central portion of the strip is engaged by the pad. This proposal addresses the problem of providing transverse ribs by (1) providing

upstream pre-conditioning or pre-elongating means for the central portion of the strip prior to that portion entering the rib-forming nip, (2) providing downstream flange gripping straightening means to straighten irregularities and to draw the strip from the rib-forming rolls, thereby tensioning the strip as it passes through the nip of the embossing rolls.

Other problems associated with prior art proposals include the complexity and cost of the cold-forming line and in the latter proposal the need to manually control some of the operations.

The present invention is particularly but not exclusively directed to a method and apparatus for continuously cold-forming strip to produce building elements having a generally channel shaped cross-section comprising a web and side walls in which the web is provided with longitudinally extending strengthening ribs and the side walls are provided with transverse ribs or corrugations extending across at least part of each side wall, of the kind described in Australian patent application number AU 48883/90. In this document each free edge margin of each side wall is flanged by downstream rolls engaging only the edge margins of the strip. It has been found that formed strip issuing from apparatus of this kind is also prone to twisting, buckling and other warping.

An object of the present invention is to addresses one or more of the problems of the prior art.

The present invention provides a cold-forming line for continuously forming metal building elements having transverse ribs extending across at least part of the element from strip, comprising means for forming transverse ribs in the strip and stress relief means for applying compression load to the transverse ribs wherein said stress relief means comprises a first roller means and a second

roller means forming a nip for receiving ribbed strip, wherein each roller means is adapted to engage an outer crest portion of each rib projecting towards it.

It is preferred that the second roller means comprises a pair of substantially parallel coextensive spaced apart second rollers.

Preferably the first roller means comprises a first roller, said first roller being substantially parallel to, coextensive with and equi-spaced from each of said second rollers.

It is preferred that each roller applies a compression load to its respective ribs to at least partially relieve stresses in the strip produced by the rib forming means and more preferably the rollers engage only the outer crest portions of the respective ribs.

It is preferred that the second rollers lie in a common plane substantially parallel to the plane of the strip and are spaced apart so that their longitudinal axes are spaced apart a distance corresponding to the distance between crests of adjacent ribs projecting towards them.

The first and second rollers may be set a predetermined distance from the nominal plane of the strip, said distance being less than the height of the ribs from the nominal plane of the strip. The predetermined distance may be sufficiently less than said height so that the rollers compress the crest portions of the respective ribs without permanent deformation thereof to effect at least partial relief of stress therein. Over compression may cause permanent deformation of the ribs, whereas too little compression may have little or no effect on the strip. The predetermined distance may be set prior to the commencement of operation or immediately thereafter. The relative displacement of the rollers from the nominal plane may be adjusted during operation of the line with the displacement

being set once substantially straight, strip substantially devoid of unwanted distortion (distortion free) begins to issue from the line. Additionally, the stress relief means according to the invention may be adjusted and set to account for variations in the quality of the strip issuing therefrom that may occur during operation of the line.

It is preferred that the line further comprises flange forming means and that the stress relief means is provided immediately downstream of the rib-forming means.

It is preferred that the transverse rib forming means comprises a pair of cylindrical rolls having respectively a plurality of mating projections and recesses, elongated axially of the rolls and spaced apart on their circumference. The cylindrical rolls form a nip through which the strip passes and the rolls may be geared to each other to maintain mating projections and recesses in register with each other thereby portions of the strip material are pushed into the recesses to permanently deform the strip to form the ribs.

It is preferred that the transverse ribs comprise corrugations. The corrugations may, for example, be substantially sinusoidal in cross-section.

The present invention also provides a method of cold-forming metal building elements having transverse ribs extending across at least part of the element from strip, comprising the steps of passing strip to means for forming transverse ribs in the strip and passing the ribbed strip to stress relief means for applying compression load to the transverse ribs wherein said stress relief means comprises a first roller means and a second roller means forming a nip for receiving ribbed strip, wherein each roll means is adapted to engage an outer crest portion of each rib projecting towards it.

In order that the invention may be more fully explained

particular embodiments will be described in detail with reference to the accompanying drawings in which:

Figure 1 illustrates a perspective view of a building element formed in accordance with the invention.

Figure 2 is a side view of apparatus for forming the element illustrated in figure 1.

Figure 3 is a plan view of apparatus illustrated in figure 2.

Figure 4 is a schematic view of the apparatus illustrated in figure 2.

Figure 5 is a view of important components of the apparatus illustrated in figure 2.

Figure 6 is a view of important components of the apparatus illustrated in figure 2.

Figure 7 is a schematic view of stress relief means and corrugated strip passing therethrough in accordance with the invention.

Figure 8 is a schematic view of a stress relief roller and corrugated strip in which the compressive load distortion of the strip is exaggerated.

Figure 9 is a side view of apparatus in accordance with another preferred embodiment of the invention.

Figure 10 is a plan view of apparatus illustrated in Figure 9.

Figure 11 is a side view of important components of the apparatus illustrated in Figure 9.

Figure 12 is an end view of components illustrated in Figure 11.

Figure 13 is a plan view of components illustrated in Figure 12.

The embodiment of a building element formed in accordance with the invention illustrated in figure 1 comprises an elongate sheet metal building element 1 of cold-rolled steel having a generally channel shaped cross-section comprising a web 2 and side walls 3 in which the web 2 is provided with longitudinally extending strengthening ribs 4 and the side walls 3 are provided with transverse ribs or corrugations 5 extending across at least part of each side wall 3 with each free edge margin of each side wall 3 being flanged 6.

A preferred embodiment of apparatus in accordance with the invention is illustrated in figures 2 to 8. The illustrated apparatus comprises a continuous cold-forming line having a coil 7 of cold-rolled steel strip 8, a series of forming rolls 9 to bend the strip 8 into a channel member having a web 2 and divergent side walls 3, longitudinal rib-forming rolls 10 to form longitudinal stiffening ribs 4 in the web 2, flange-forming rolls 11 to profile the free edge margin of each side wall 3, transverse rib-forming means in the form of two pairs 21, 22 of transverse rib-forming rolls 12, 13, each pair of rolls 12, 13 engaging a respective side wall 3.

Each side wall 3 passes through the nip of its respective pair of rolls 12, 13, which comprise cylindrical

rolls having respectively a plurality of mating projections 34 and recesses 35, elongated axially of the rolls 12, 13 and spaced apart on their circumference. The rolls 12, 13 of each roll pair 21, 22 are geared to each other to maintain mating projections 34 and recesses 35 in register with each other thereby portions of the strip material are pushed into the recesses to permanently deform the strip to form the ribs 5.

Additionally each roll pair 12, 13 is geared to each other to maintain the ribs 5 formed in one side wall 3 in register with those formed in the other side wall 3.

Alternatively they may be geared to maintain any predetermined relationship between the ribs of the respective side walls with one another.

Stress relief means for applying compression load to the transverse ribs are provided immediately downstream of each pair of transverse rib-forming rolls 12, 13.

The stress relief means 23, 24 comprises a first roller means and a second roller means forming a nip for receiving ribbed strip 8, wherein each roller means is disposed to engage an outer crest portion of each rib 5 projecting towards it. The second roller means comprises a pair of substantially parallel coextensive spaced apart second rollers 14, 15 and the first roller means comprises a first roller 16, said first roller 16 being substantially parallel to, coextensive with and equi-spaced from each of said second rollers 14, 15.

As illustrated in figure 1, the transverse ribs 5 comprise corrugations being substantially sinusoidal in cross-section.

As best seen in figures 6, 7 and 8 each roller 14, 15, 16 of the stress relief means 23, 24 applies a compression load to its respective ribs 5 to at least partially relieve stresses in the strip 8 produced by the rib-forming means

12, 13 and more specifically engage only the outer crest portions of the respective corrugations 5.

As illustrated in figures 6 and 7 the second rollers 14, 15 lie in a common plane substantially parallel to the plane of the strip 8 and are spaced apart so that their longitudinal axes are spaced apart a distance [W] corresponding to the distance [W] between crests of adjacent corrugations 5 projecting towards them.

Additionally the first and second rollers 16, 14 and 15, are set a predetermined distance [H] from the nominal plane 24' of the strip 8, said distance [H] being less than the height [A/2] of the corrugations 5 from the nominal plane of the strip 8. The predetermined distance [H] is sufficiently less than said height [A/2] so that the rollers 14, 15 ,16 compress the crest portions of the respective ribs 5 without permanent deformation thereof to effect at least partial relief of stress therein. Figure 8 illustrates an exaggerated deformation of the crest of a rib as it passes a roller 16. Over compression causes permanent deformation of the ribs 5, whereas too little compression has little or no effect on the strip 8. The predetermined distance [H] can be set prior to the commencement of operation or immediately thereafter. The relative displacement of the rollers from the nominal plane can be adjusted during operation of the line with the displacement being set once straight, distortion free strip begins to issue from the line. Additionally, the stress relief means according to the invention may be adjusted and set to account for variations in the quality of the strip issuing therefrom that may occur during operation of the line.

Another preferred embodiment of apparatus in accordance with the invention is illustrated in Figures 9 to 13. The illustrated apparatus comprises a continuous cold-forming line provided with an uncoiling assembly 17 having a coil of

cold-rolled steel strip, a feed roll assembly 18 to feed strip from coil to the other components of the line, a shear assembly 19 to cut the strip into predetermined lengths, said shear assembly being disposed downstream of the feed roll assembly 18, longitudinal rib-forming rolls 20 to form longitudinal stiffening ribs 4 in the web being disposed in advance of transverse rib-forming means in the form of two pairs 21A, 22A of transverse rib-forming rolls 12A, 13A, each pair of rolls 12A, 13A engaging a respective side wall 3, stress relief means 23A, 24A for applying compression load to the transverse ribs, the stress relief means 23A, 24A being are provided immediately downstream of each pair of transverse rib-forming rolls 12A, 13A, and a series of forming rolls 29 to bend the strip into a channel member having a web 2 and divergent side walls 3 and to profile the free edge margin of each side wall 3, provided downstream of the stress relief means 23A, 24A.

This latter described embodiment differs from the former described embodiment primarily in that the transverse-rib forming means and stress relief means are disposed in advance of the channel-forming rolls and flange forming rolls.

It has surprisingly been found that the sequence of cold forming operations and equipment in the line can be changed without undue detriment to the quality of the cold-formed building elements produced, provided only that the transverse rib-forming means is disposed immediately in advance of the stress relief means in accordance with the invention.

It has been found that the present invention enables the strip issuing from the nip of the transverse rib-forming rolls to be at least partially relieved of residual tensile stresses without the strip being held in tension as it passes through the nip. It also been found that the present

invention provides an elegantly simple and inexpensive means of providing stress relief to such strip.

Particular embodiments of the invention has been described and illustrated by way of example, but it will be appreciated that other variations of and modifications to the invention can take place without departing from the spirit and scope of the invention. For example, the transverse rib-forming means and stress relief means may be provided upstream of longitudinal flange-forming means with the transverse ribs being formed prior to the longitudinal bending and flange forming operations. Further the stress relief rollers may be coated with an elastomeric material. The elastomeric material may, for example, be neopene or other hard elastomer. Additionally, the coiled strip may be provided with a corrosion-resistant coating, such as, for example, an aluminium zinc alloy, a thin paint coating or other coating.

In the claims which follow and in the preceding summary of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprising" is used in the sense of "including", ie the features specified may be associated with further features in various embodiments of the invention.

CLAIMS:

1. A cold-forming line for continuously forming metal building elements having transverse ribs extending across at least part of the element from strip, comprising means for forming transverse ribs in the strip and stress relief means for applying compression load to the transverse ribs wherein said stress relief means comprises a first roller means and a second roller means forming a nip for receiving ribbed strip, wherein each roller means is adapted to engage an outer crest portion of each rib projecting towards it.

2. A cold-forming line as defined in claim 1 wherein the second roller means comprises a pair of substantially parallel coextensive spaced apart second rollers.

3. A cold-forming line as defined in claim 2 wherein the first roller means comprises a first roller, said first roller being substantially parallel to, coextensive with and equi-spaced from each of said second rollers.

4. A cold-forming line as defined in claim 3 wherein each roller applies a compression load to its respective ribs to at least partially relieve stresses in the strip produced by the rib forming means.

5. A cold-forming line as defined in any one of claims 2 to 4 wherein the rollers engage only the outer crest portions of the respective ribs.

6. A cold-forming line as defined in any one of claims 2 to 5 wherein the second rollers lie in a common plane substantially parallel to the plane of the strip and are spaced apart so that their longitudinal axes are spaced

apart a distance corresponding to the distance between crests of adjacent ribs projecting towards them.

7. A cold-forming line as defined in any one of the preceding claims wherein the first and second roller means are set a predetermined distance from the nominal plane of the strip, said distance being less than the height of the ribs from the nominal plane of the strip.

8. A cold-forming line as defined in claim 7 wherein the predetermined distance may be sufficiently less than said height so that the roller means compress the crest portions of the respective ribs without permanent deformation thereof to effect at least partial relief of stress therein.

9. A cold-forming line as defined in claim 7 or 8 wherein the predetermined distances are set prior to the commencement of operation or immediately thereafter.

10. A cold-forming line as defined in any one of the preceding claims wherein the relative displacement of the roller means from the nominal plane of the strip is adjusted during operation of the line with the displacement being set once substantially straight, strip substantially devoid of unwanted distortion begins to issue from the line.

11. A cold-forming line as defined in any one of the preceding claims wherein the stress relief means is adjusted and set to account for variations in the quality of the strip issuing therefrom that occur during operation of the line.

12. A cold-forming line as defined in any one of the preceding claims wherein the line further comprises flange

forming means and that the stress relief means is provided immediately downstream of the rib-forming means.

13. A cold-forming line as defined in any one of the preceding claims wherein the transverse rib-forming means comprises a pair of cylindrical rolls having respectively a plurality of mating projections and recesses, elongated axially of the rolls and spaced apart on their circumference.

14. A cold-forming line as defined in claim 13 wherein the cylindrical rolls form a nip through which the strip passes and the rolls are geared to each other to maintain mating projections and recesses in register with each other thereby portions of the strip material are pushed into the recesses to permanently deform the strip to form the ribs.

15. A cold-forming line as defined in any one of the preceding claims wherein the transverse ribs comprise corrugations.

16. A cold-forming line as defined in claim 14 wherein the corrugations are substantially sinusoidal in cross-section.

17. A cold-forming line as defined in any one of the preceding claims further including means to provide the building elements with a generally channel shaped cross-section comprising a web and side walls in which the web is provided with longitudinally extending strengthening ribs and the side walls are provided with said transverse ribs or corrugations extending across at least part of each side wall.

18. A cold-forming line as defined in claim 17 wherein each

free edge margin of each side wall is flanged by downstream rolls engaging only the edge margins of the strip.

19. A method of cold-forming metal building elements having transverse ribs extending across at least part of the element from strip, comprising the steps of passing strip to means for forming transverse ribs in the strip and passing the ribbed strip to stress relief means for applying compression load to the transverse ribs wherein said stress relief means comprises a first roller means and a second roller means forming a nip for receiving ribbed strip, wherein each roll means is adapted to engage an outer crest portion of each rib projecting towards it.

20. A method as defined in claim 19 wherein the second roller means comprises a pair of substantially parallel coextensive spaced apart second rollers.

21. A method as defined in claim 19 or 20 wherein the first roller means comprises a first roller, said first roller being substantially parallel to, coextensive with and equi-spaced from each of said second rollers.

22. A method as defined in claim 20 or 21 wherein each roller applies a compression load to its respective ribs to at least partially relieve stresses in the strip produced by the rib forming means.

23. A method as defined in any one of claims 19 to 22 wherein the roller means engage only the outer crest portions of the respective ribs.

24. A method as defined in any one of claims 20 to 22 wherein the second rollers lie in a common plane

substantially parallel to the plane of the strip and are spaced apart so that their longitudinal axes are spaced apart a distance corresponding to the distance between crests of adjacent ribs projecting towards them.

25. A method as defined in any one of claims 19 to 24 comprising the further step of setting the first and second roller means a predetermined distance from the nominal plane of the strip, said distance being less than the height of the ribs from the nominal plane of the strip.

26. A method as defined in any one of claims 18 to 24 wherein the roller means compress the crest portions of respective ribs extending towards them without permanent deformation thereof to effect at least partial relief of stress therein.

27. A method as defined in claim 25 or claim 26 when applied to claim 25 wherein the step of setting the predetermined distance is performed prior to the commencement of operation.

28. A method as defined in any one of claim 25 or claim 26 when applied to claim 25 wherein the further step of adjusting the relative displacement of the roller means from the nominal plane is performed during operation of the line with the displacement being set once substantially straight strip substantially devoid of unwanted distortion begins to issue from the line.

29. A method as defined in any one of claims 19 to 28 comprises the further step of adjusting and setting the stress relief means to account for variations in the quality of the strip issuing therefrom that occur during operation

of the line.

30. A method as defined in any one of claims 19 to 29 wherein the step of stress relief occurs downstream of the rib-forming step

31. A method as defined in any one of claims 19 to 30 wherein the step of forming transverse ribs is performed by means of a pair of cylindrical rolls having respectively a plurality of mating projections and recesses, elongated axially of the rolls and spaced apart on their circumference.

32. A method as defined in claim 31 wherein the cylindrical rolls form a nip through which the strip passes and the rolls are geared to each other to maintain mating projections and recesses in register with each other thereby portions of the strip material are pushed into the recesses to permanently deform the strip to form the ribs.

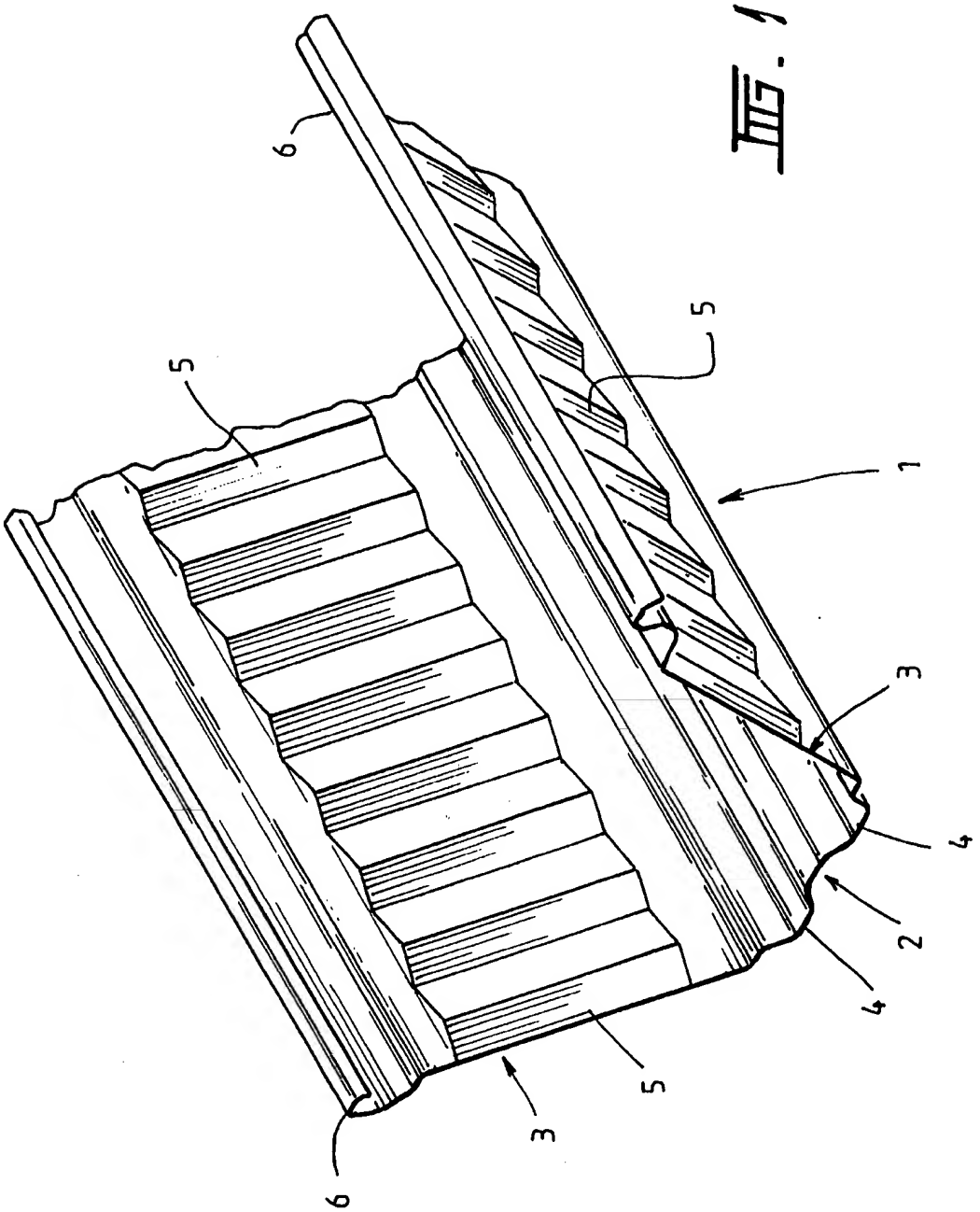


Fig. 1.

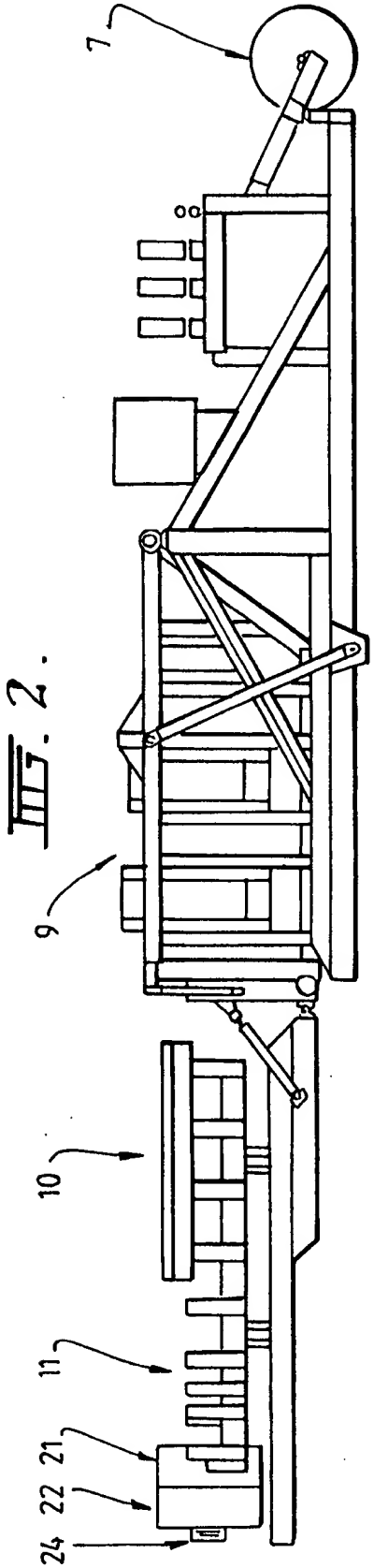


FIG. 2.

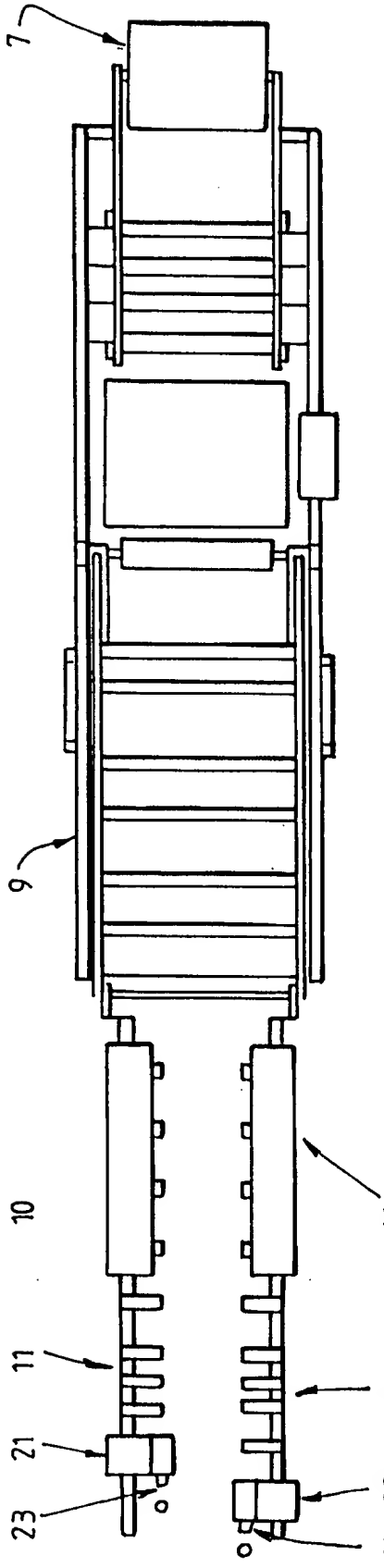
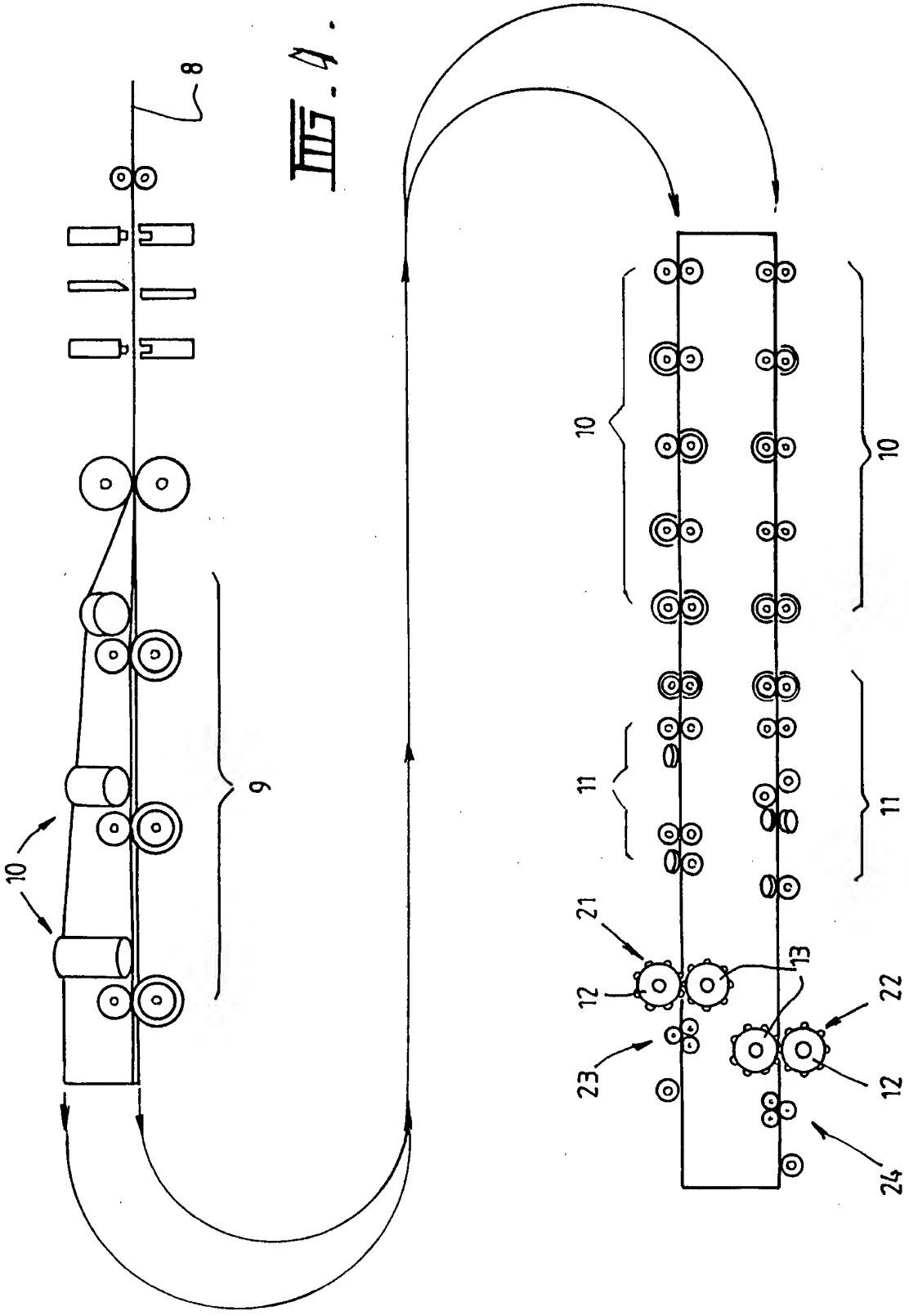


FIG. 3.

Fig. 4.



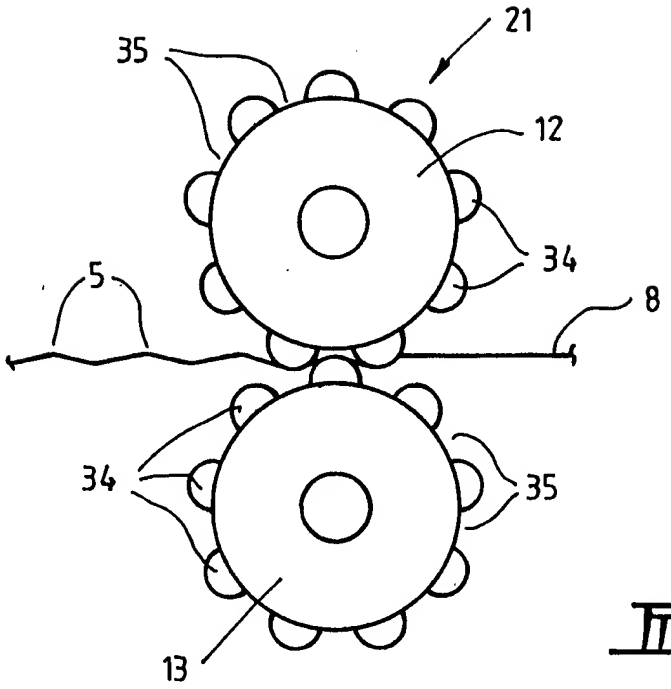


FIG. 5.

FIG. 6.

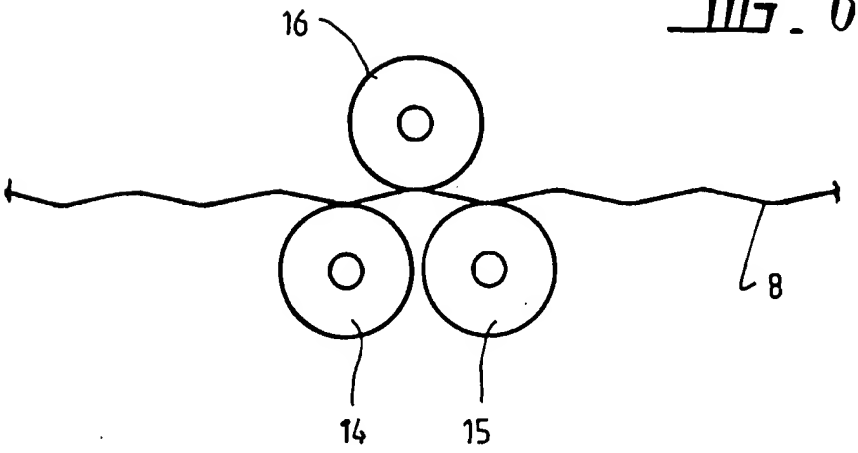


FIG. 7.

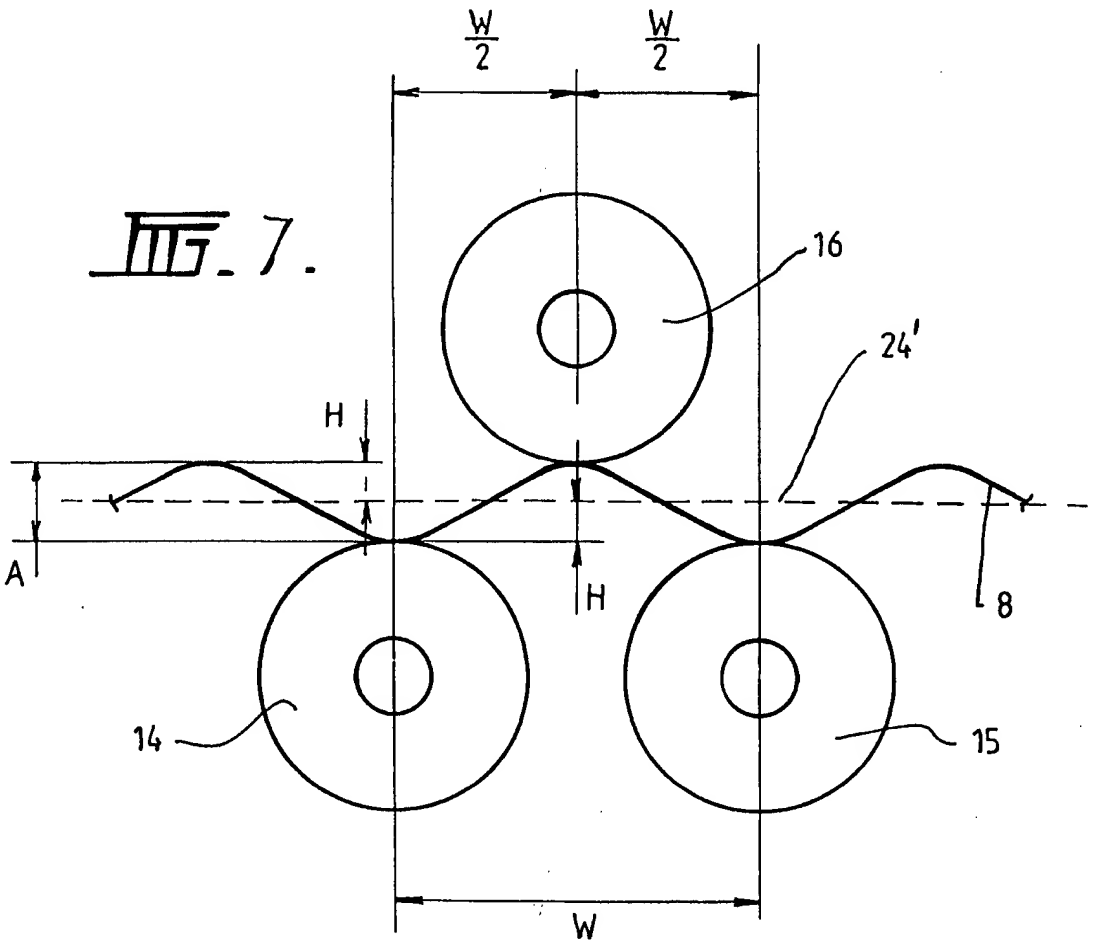
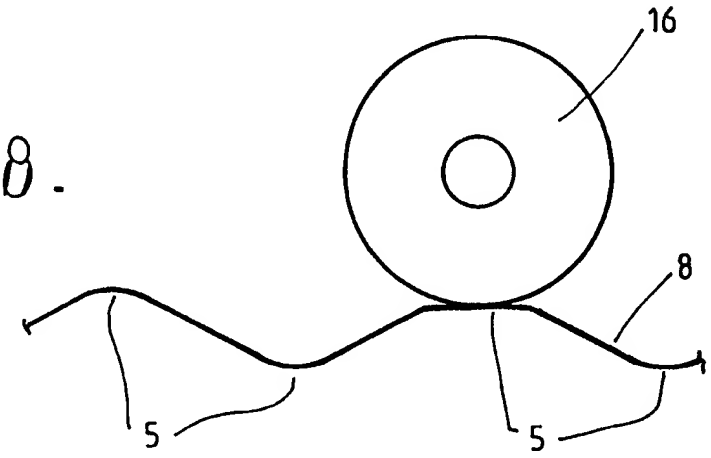


FIG. 8.



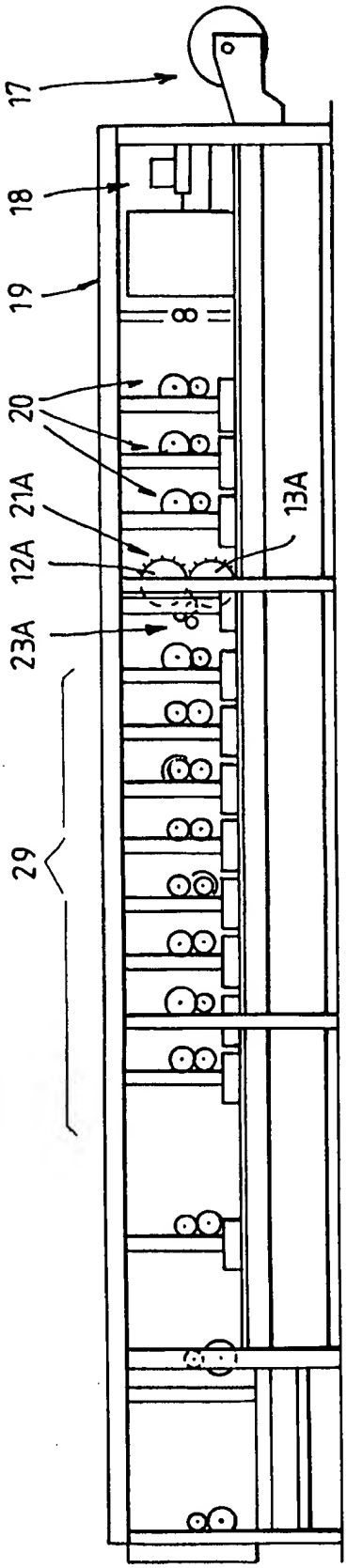
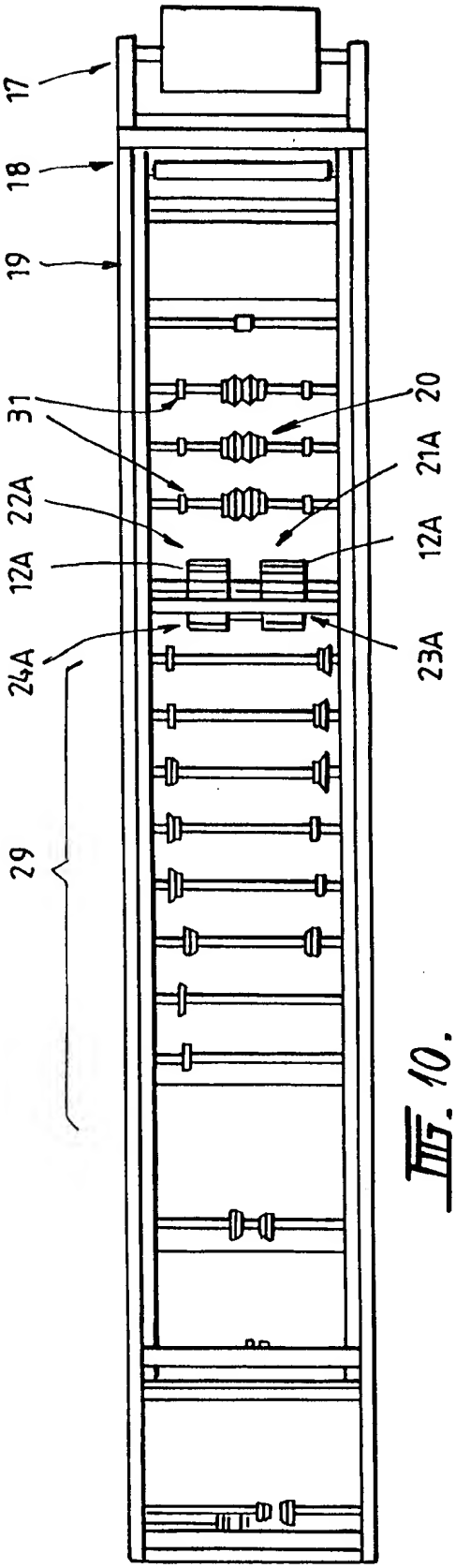

17
18
19
20
21A
12A
23A
29
13A

Fig. 9.


17
18
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31
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22A
21A
12A
12A
24A
23A
29

Fig. 10.

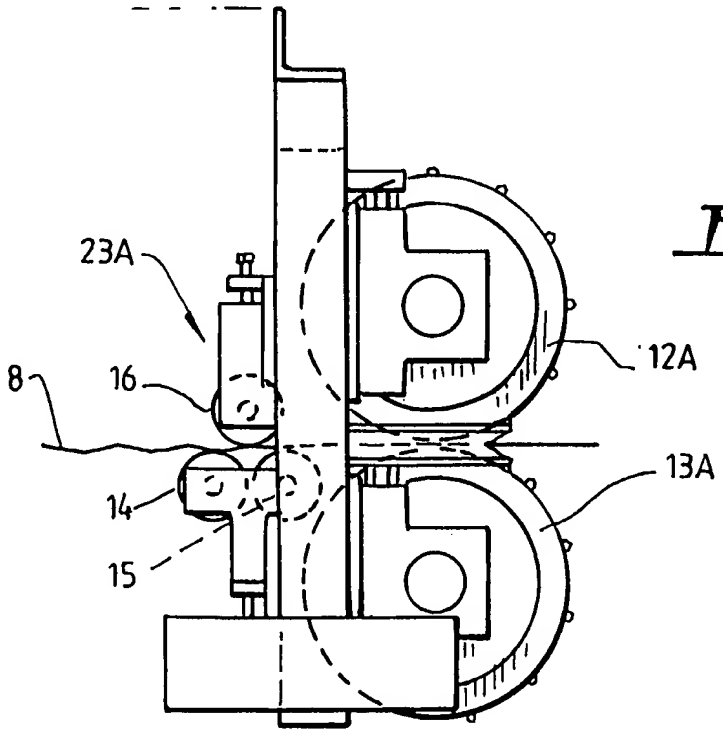

FIG. 11.

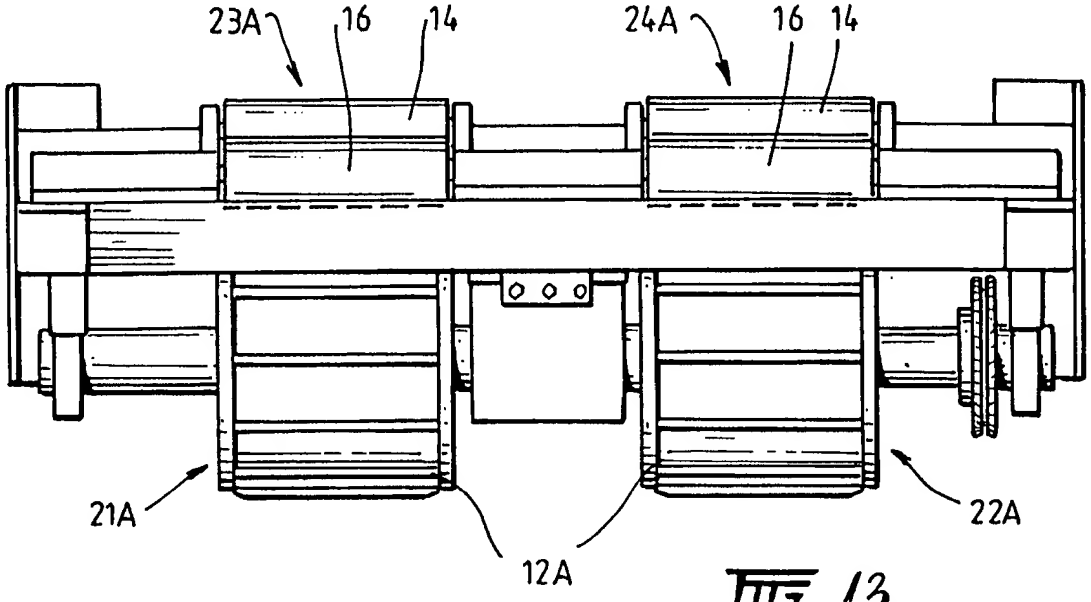

FIG. 13.

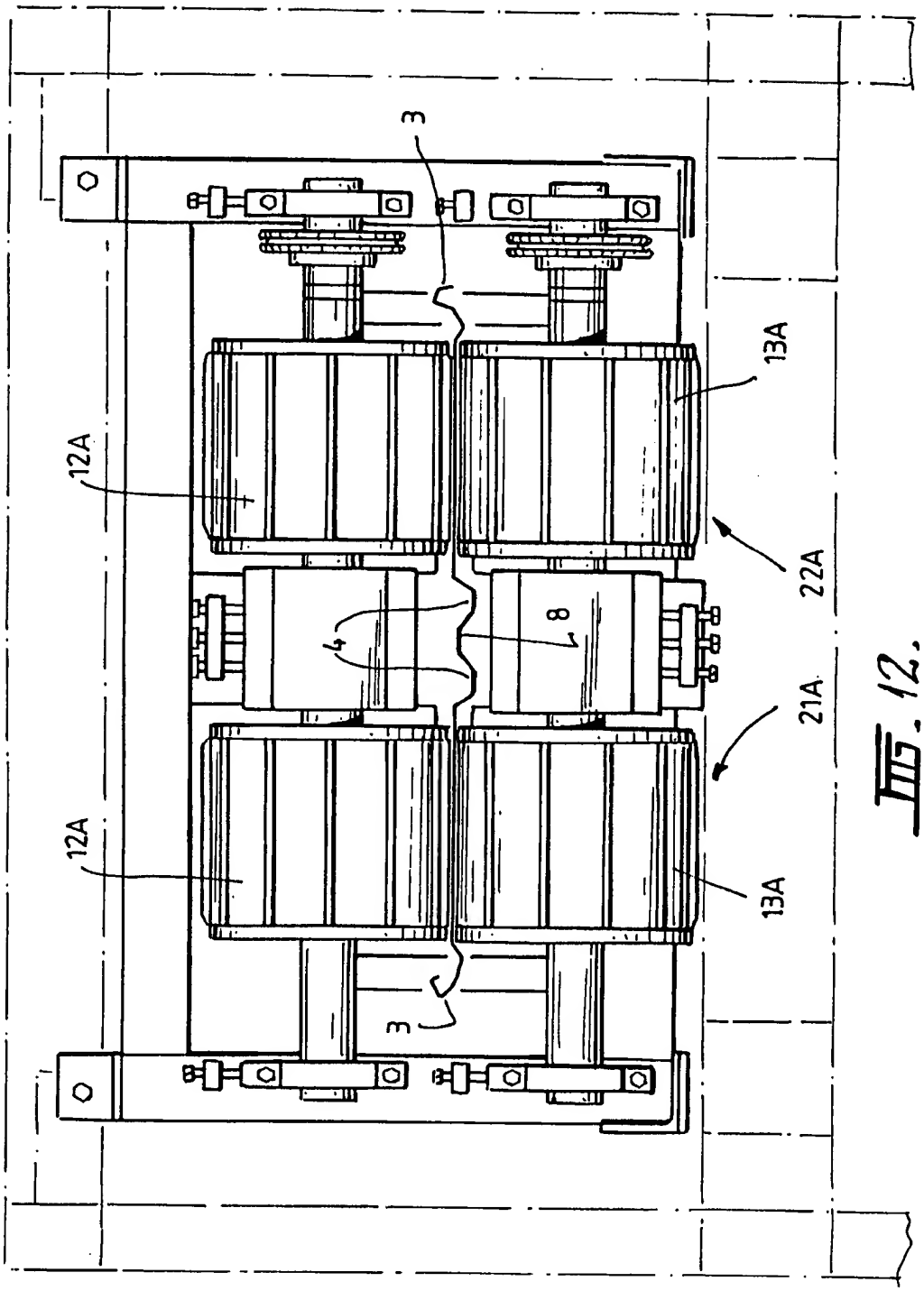

FIG. 12.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00175

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: B21D 13/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: B21D 13/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4753096 A (WALLIS) 28 June 1988 entire document	1-32
A	EP 0203385 A (EICHENER MASCH KURT) 3 December 1986 entire document	1-32
A	SE 8300985 B (BACKMAN) 6 October 1986 entire document	1-32

☐ Further documents are listed in the continuation of Box C

☐ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 April 1998	30 APR 1998
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer **D.G. FRY** Telephone No.: (02) 6283 2130